Do you want our opinion on immission control?

IMMI – Noise prediction and dispersion of air pollutants
For more than 20 years, service providers, authorities and industrial companies have been relying on IMMI as one of the leading software tools in the field of immission control. IMMI is our software solution for the calculation of sound propagation outdoors, noise exposure in workrooms and propagation of air pollutants.

An intuitive user interface controls the quality-assured calculation algorithms, which represent almost all common national and international regulations of immission control. Thanks to the modular software design, the configuration can be optimally adapted to the user’s requirements.

The basic idea of our concept - Every base module features the DIN 18005 element library and the Gaussian plume model for calculating the dispersion of air pollutants and dust (TA Luft 1986). Element libraries for noise and air pollutants can be added optionally to create your individual version.

IMMI is available in four different base module versions – Choose your individual equipment.

**IMMI Basic**

… is the cost efficient solution for all those who require calculations with optimal accuracy and complete documentation of input and output data.

**IMMI Standard**

… gets you started in the world of noise mapping. The optimized performance scope allows the user to process noise projects with high efficiency and at low cost. In this version, the number of obstacles is limited to 200. Every one of these obstacles may contain up to 200 diffracting edges.

**IMMI Plus**

…. is the universal program package which enables the user to calculate, evaluate and present almost all projects. To achieve this, IMMI Plus features a plurality of options which optimally support users in their work. The number of elements is only limited by the available main memory. With its up to 64 million grid points and up to 1000 obstacles, this version allows processing even large-size projects.
IMMI Premium

... is the professional tool for creating large-scale noise maps with an excellent price-performance ratio. The scope of this version leaves nothing to be desired and is especially configured for the management of large data volumes. In this package, there is no limit to the number of elements or obstacles. In addition, it features options for distributed and segmented calculation in the network.

All expansion versions provide the following performance features:

- 3D Viewer
- Data import/export (DXF, ASCII, etc.)
- Macros (transformations, constructing noise-emitting buildings, designing openings)
- Calculation of $L_{den}/L_{night}$ according to the Environmental Noise Directive 2002/49/EC
- Support of coordinate systems and coordinate transformation
- Optimization of noise barriers
- Sound transmission of noise barriers
- Noise allocation
- QSI data interface according to DIN 45687

The following performance features can be added depending on the base modules:

- Calculation of multiple higher order reflections
- Databases (emission, attenuation, absorption)
- Expanded grid functions for linking and evaluating grid results
- Calculation of vertical grids
- Calculation of façade levels and exposure analysis according to Directive 2002/49/EC
- Hotspot analysis for action plans
- ACC (automatic cluster calculation) for calculation in the network
- ArcGIS data interface

A detailed description of individual performance features can be found in the data sheets.

Special configuration IMMI air pollution

... is the cost-effective solution for all those who are engaged in calculating the dispersion of air pollutants according to TA Luft 2002 (AUSTAL2000). For more information, please refer to our data sheets.
The emission and noise impact calculations in IMMI are based on pertinent rules and standards. All rules, algorithms, tables and nomograms of a specific standard are comprised in an "element library". Along with the base module, one or more selected element libraries form the customized tool for calculating noise and the dispersion of air pollutants.

All relevant calculation methods for national and international use have been implemented. Not forgetting the European Environmental Noise Directive 2002/49/EC and its implementation for application in the countries of the EU.

Road traffic noise

- RLS 90 – Richtlinie für den Lärmschutz an Straßen (DE)
- RLS 16 – Richtlinie für den Lärmschutz an Straßen (DE) coming soon
- PLS (Parkplatzlärmstudie) 07 – Examination of noise impact from parking places, rest stops and bus terminals as well as from indoor parking lots and underground car parks (conducted by the Bayrisches Landesamt für Umweltschutz (LfU, Administrative Office of Bavaria for Environmental Protection) (DE)
- RVS 04.02.11 – Calculation of road traffic noise (AT)

- STL 86 – Swiss standard for the calculation of road traffic noise (CH)
- SonRoad – Road traffic noise calculation model (BUVAL) (CH)
- CNOSSOS-EU – Road (EU)
- NTF S 31-133 (NMPB 2008) - Noise of earth-bound transport – Calculation of the attenuation of sound during propagation outdoors including meteorological effects (with French emission model Guide du Bruit 2008) (FR)
- CRTN - Calculation of Road Traffic Noise (UK)
- RMW - Reken- en Meetvorschriften Wegverkeerslawaaie (NL)

Industrial noise

- DIN 18005 – Noise protection in city planning (DE)
  - Part 1 – Calculation methods
  - Part 2 – Noise maps; graphical representation of noise pollution
- VDI 2571 – Sound radiation from industrial buildings (DE)
- VDI 2714 – Sound propagation outdoors (DE)
- VDI 2720, Part 1 – Sound control by barriers outdoors (DE)
ISO 9613 – Attenuation of sound during propagation outdoors (EU)
  - Part 1: Calculation of the absorption of sound by the atmosphere
  - Part 2: General method of calculation
ÖAL Directive No. 28 – Sound radiation and sound propagation (AT)
BS5228 – Part 1 - British Standard - Noise and vibration control on construction and open sites
  Part 1: Code of practice for basic information and procedures for noise and vibration control (UK)
CNOSSOS-EU – Industry (EU)

**EU interim directives/2002/49/EC**

- **Road traffic:** XP S 31-133/NMPB + Guide du Bruit
- **Railway traffic:** RMR-SRM II 1996
- **Industrial noise:** ISO 9613-2
- **Airport traffic:** ECAC.CEAC Doc. 29 2nd edition

**Railway noise**

- Schall 03 – Directive on the calculation of railway traffic noise (DE)
- Schall Transrapid – Magnetic levitation system decree (DE)
- ON Rule S 305011 – Calculation of sound immersion caused by railway traffic (train traffic, shunting and cargo handling operations) (AT)
- Semibel – Swiss emission and noise impact model for the calculation of railway traffic noise (CH)
- CRN – Calculation of Railway Noise with supplement 1: Procedure for the Calculation of Noise from Eurostar Trains Class 373 (UK)
- CNOSSOS-EU – Railway (EU)

**Noise at workplaces**

- VDI 3760 - Computation and measurement of sound propagation in workrooms (DE)
### Shipping noise

- ABSAW – Guideline for the calculation of propagation of airborne sound at Federal Waterways (BfG) [DE]

### Rating methods

18. BImSchV (incl. 4 h rule) • TA Lärm • DIN 18005 • $L_{den}$ • Recreational noise directives • 16. BImSchV

### Aircraft noise

- AzB 2008 – Guideline for the calculation of noise protection areas at civil and military airports according to the German act on aircraft noise (“Gesetz zum Schutz gegen Fluglärm”), in combination with the data acquisition system DES (“Datenerfassungssystem”) for the determination of noise protection areas at civil airports [DE]
- ÖAL-Richtlinie No. 24, Sheet 1 – Noise abatement zones in the environment of airports; planning and calculation specifications [AT]
- CNOSSOS-EU – Aircraft [EU]

**Combining of various noise sources according VDI 3722**
Air pollutants
- ÖNORM M 9440 (Gaussian plume model) (AT)

Project work and data management

Data input
- Input of geometry data through keyboard and mouse or on the screen using (georeferenced) background bit maps (more than 30 different graphic formats incl. PDF)
- Import of geometry and technical data through different data interfaces Formats: DXF, ASCII, TXT, ArcGIS (shape), QSI
- Connection to Open Street Map and 7 more map browser
- Support of all European coordinate systems (UTM, Gauss-Krüger, etc.) for georeferencing and coordinate transformation
- Project-based work on a graphical user interface with GIS functionality
- User-friendly management of project data, results and grids
- Standard elements: buildings, walls, reflecting element, land use zones, ground effect, attenuation by vegetation and housing, traffic light, receiver point, compass, bridge, cantilevered barrier
- Emission sources subdivided into point, line and area sound sources, as well as traffic routes (roads, railways, air, and water), tunnels and parking lots
- Measurement of distances and angles
- Auxiliary functions for geometry editing, such as copying, moving, parallel curves, adjustment to terrain profile
- Cartographic elements (scale, legend, text boxes)
- Determination of the terrain with triangular decomposition based on altitude and/or altitude lines, or digital terrain model based on grid data
- Multiple zoom function using the mouse wheel
- Support of operating with multiple monitors
Variants

- Definition of variants for calculating case studies, scenarios, planning versions

Editing and visualizing objects

- Element database with display of technical data: tabular output, sorting by input data (e.g. number of inhabitants or vehicles), block functions for editing multiple elements at the same time
- Edit, delete, change, copy, join, split and move single or multiple elements using the mouse
- Adjust elements to the terrain and vice versa, with display of the terrain level profile
- Control the visibility of elements in the map
- Design tools and macros: build dams or cuts, generate reception points automatically, transform elements, draw free body diagrams of altitude lines, count kilometers, generate circular buildings and parallel elements, construction of vertical surfaces
- Insert nodes into polygons, delete nodes from polygons, attach nodes to polygons, check nodes, generate equidistant sections
- Constant or linear z-values in ascending or descending order, relative or absolute height
- Differentiate inhabitants in buildings from land use zones
- Thematic maps for graphical representation and monitoring of input data, e.g. display of building heights, inhabitants per building, display of the terrain model, rating of the land use zones, etc.
- Many toolboxes for quick processing
- Horizontally aligning of buildings in terrain

Special functions for industrial noise

- Databases for sound emission values, transmission and absorption losses, meteorological annual statistics and time series, tabular output
- Macro for generating 3D structures, e.g. buildings with noise-emitting walls for calculating industrial noise
- Multiple reflections up to the 50th order
- Sound transmission of walls
- Input and calculation of linear or A-weighted cumulative, octave band and third octave band levels
- Room conditions according to EN 12354-4
- Display of noise producers
- Evaluation according to TA Lärm or individual methods
- Import of spectra from the clipboard
- Calculation of indoor levels according to Sabine or VDI 3760
- Calculation of R\text{\textsubscript{W}} acc. to DIN EN ISO 717-1
- Calculation of WEA acc. to LAI
- Calculation acc. to ISO TR 17534
- Diurnal variation
Special noise mapping functions

- Support of large-size terrain models and simplification functions (VIP)
- Input of the building use (resid. building, school, kindergarten, hospital, uninhabited), number of storeys, dwellings, inhabitants
- Calculation of noise maps and façade levels according to EU Directive 2002/49/EC
- Pre-defined rating method $L_{den}$
- Fast automatic calculation for segmented and distributed calculation in networks
- Hotspot analysis at traffic routes
- Noise map for buildings

Checking and testing functions

Plausibility and geometry checks, clearly arranged lists of the data entered and graphical functions are available for checking the input data.

- Check and edit geometry conflicts; intersection of altitude lines, intersection of buildings and roads, self-intersection of elements
- Find identical and similar elements
- Detect reception points inside buildings
- Adjust sound sources on bridges
- Calculate the terrain model (triangulation)
- Conformity with DIN 45687 – fulfilling test tasks
- Estimate the inaccuracy of results in case of optimized calculation models
- Check test tasks using the QS-Manager
- Display sound beams and reflections

Calculation

Single points, reception grids and façade levels can be easily calculated, while sophisticated algorithms provide for short calculating times.

Calculation model

- Calculation according to reference (strictly as per directive) and optimized calculation model
- Automatic segmentation of line and area sound sources
- Compliance with standard-specific distance criteria
- Projection techniques help prevent discontinuities caused by obstacles and reflecting surfaces
- Multiple reflections up to the 50th order
- Free field in front of reflecting surfaces
Calculation Control Center (CCC) for performing the calculation

- Central management of all calculations at single points, in the grid or on façade points
- Automatic calculation jobs by means of batch job control; calculation of single points, grid and façade levels as well as of all project variants in one go
- Integrated management and registration of the results calculated
- Powerful variant management to allow studying planning scenarios
- Results lists with extended functionality
- Calculation of horizontal and vertical grids in sections of the map or in user-definable land use zones
- Color scale according to DIN 18005, ISO 1996-2, ÖAL 36, and many more
- Support of multicore computers
- Segmented and distributed calculation in the network – automated
- Linking of results
- Estimation of calculating times
- Linking and editing of calculation results with numerous mathematical functions

Single point calculation

Results are saved in lists with varying itemization degree. User-definable layouts are used for representation.

- Short lists: Overview of reception point and/or rating levels for all rating periods. Comparison of results with guidance values.
- Mid-size lists: Contribution of each single sound source to the total noise impact level, identification of main sound sources and frequency contents.
- Long lists: Detailed and testable summary of all influencing variables, intermediate and final results
- Display of sound beams and reflections
- Comparison of the calculation results of variants

IMWI helps you view the lists on the screen, print complete or selected areas, copy and paste such areas to MS WORD or MS EXCEL or to TXT, RTF and HTML format via the clipboard. Additional functions facilitate comparing different variants.

Multi-Core – ACR – Segmented Calculation

These three functions considerably reduce calculating times

- Use of calculators to reduce the computation time
Grid calculation

The PREMIUM version features functions enabling the calculation of more than a billion points in a reception point grid and their output in many forms. Powerful functions for postediting, combining and evaluating reception point grids facilitate working with the project.

- Simultaneously calculate all rating periods (day, evening, night, resting, etc.)
- Display defined color scales according to DIN 18005, ISO 1996-2, planning guideline ASFINAG
- Display isolines
- Use mathematical operations
- Link grid results
- Join partial grids
- Generate differential grids (logarithmic and energetic)
- Create conflict maps and population equivalent values
- Export noise maps as contour areas to ArcGIS, ASCII or binary ArcGIS files, DXF

Façade calculation / exposure analysis

Test points along façades are calculated at a defined height and at a defined distance from the wall.

- Exposure analysis according to Directive 2002/49/EC: Statistical evaluation of all inhabitants or proportionate evaluation, output of the apartments, schools, kindergartens and hospitals affected
- Evaluation of the area examined, either as a whole or in parts as well as element by element
- Allocation to noise bands (L_{day}, and L_{night})
- Import and export of the results via ArcGIS data interface
- Additional statistical evaluations: min. and max. levels on buildings, all levels on buildings

Documentation and presentation

Lists of input data and results

- Input data, intermediate results and final results are documented in the form of clearly arranged tables which can be printed and applied to MS WORD, MS EXCEL, RTF, TXT, HTML.

Report manager

The report manager function provides a powerful tool enabling users to design printouts and reports according to their individual needs and in many versatile forms.

- Redefined paper formats and page layouts from size A4 to size A0 in portrait and landscape formats
Various layout components for structuring the printout as desired: plan/grid, text, graphic, color legend, element legend, header and footer

Use of text boxes and plan clippings that can be designed as desired, support of a whole variety of fonts allowing different font colors, font sizes and font presentations

Numerous options of labeling the axes and contour lines and displaying the scale

Parallel output of all point, façade and grid results

Output of layouts and thematic maps

Printout of graphic files in more than 30 image formats, e.g. BMP, JPG, etc.

The complete testable documentation and the impressive presentation of the calculation results rank among the strong points of the IMWI programming system.

3D Viewer

The powerful 3D Viewer allows moving through the 3D model in three different settings.

- Profile sections, screenshots and video recordings
- Automatic flight along line elements
- Graphic symbols for roads, vegetation, traffic light, vehicles
- Mark and modify elements

Current applications

Air pollutants

The pollutants module in IMWI features the calculation of dispersion of gas, dust and odor both according to the particle model (TA Luft 2002 / AUSTAL2000) and to the Gaussian model (TA Luft 1986). For this purpose, IMWI has been provided with a convenient user interface. It is similarly easy to combine the calculation of air pollutants with the forecast of noise, two environmental impacts which often originate from the same producers.

Noise impact of wind turbines

IMWI can also be used for calculating the noise impact of wind turbines. The program is subject to quality assurance and performs calculations based on the following standards:

- Calculation of sound propagation according to ISO 9613 (taking into account the LAI-procedure)
- Evaluation according to TA Lärm
- Quality-assured software according to DIN 45687
**Noise at workplaces module**

The noise at workplaces module in IMMI is ideally suited for analyzing the noise situation on factory floors and for determining the sound decay curves (SDC) according to VDI 3760. IMMI now enables you to calculate and evaluate your noise reduction measures on factory floors and at workplaces for industrial and commercial companies.

- Implementation of VDI 3760 (computation and measurement of sound propagation in workrooms, 1996)
- Sound decay curves (SDC) with statistical theory (Sabine) and mirror source methods with raytracing (description depth 4)
- Determination of characteristic values for evaluating the acoustic quality of workrooms
- Application-related design macros
- “Baffle ceiling” macro
- Consideration of multiple reflections
- Calculation of the sound power according to the enveloping surface method of EN ISO 3744 on machines

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**Technical data**

**Hardware requirements**

- 32-bit processor – calculation accelerated by multiprocessor systems (at least 2 GB RAM)
- 64-bit processor – calculation accelerated by multiprocessor systems (at least 2 GB RAM per kernel)
- 400 MB unassigned hard disk storage capacity for program installation
- Monitor resolution: 1024 x 768
- Graphics card with 3D acceleration and MS DirectX
- Mouse and keyboard

IMMI can be run on tabletop computers and notebooks and in networks.

- Networkkey: Use of VPN
Interfaces/compatibility

IMMI supports data exchange with the following programs/formats:

- DXF (z. B. von AutoCAD)
- ASCII, TXT
- ArcGIS (.dbf, .shp, .shx) / ArcGIS Grid (binary and ASCII)
- QSI (.qsi, .dbf, .shp, .shx) according to DIN 45687
- AUSTAL2000
- More than 30 different graphic formats
- OpenStreetMap, Bing ...

Support pages on our website/ customer log-in

As a customer, you have access to the internal pages of our website where you can find out about novelties, download updates and obtain exclusive product information.

- News on IMMI
- Download of updates, manuals, documentations and tutorials
- News ticker about workarounds, suggestions and tips
- Offers on the program
- E-mail function directly from the program

Technical support / maintenance contract

- Technical support by phone and e-mail to answer your questions about handling the software through our hotline
- Automatic acquisition of all software updates
- Program configuration supplemented at lower prices

Performance scope

- Installation CD
- Access to the customer area of our website
- Hardkey (USB) for program backup as single user or network license
- Tutorial for noise and air pollutants
- 12-month warranty, incl. update and hotline service
Summary

Training courses and seminars

Our range of training courses and seminars always is as up-to-date as our software and measurement systems. For us, optimal service means the following: whether beginners or advanced users, we offer the appropriate further training in our modern training classrooms at Höchberg.

- Training courses
- Workshops / special seminars
- Company seminars

Our website keeps you informed about current events and dates: www.woelfel.de/en/training

Fields of application and target groups

IMMI is a tool for calculating noise and air pollutants and is suitable for all those who

- are in charge of issues concerning immission control and air pollution prevention at authorities,
- prepare expert opinions for engineering consultants,
- perform noise calculations for approval procedures in industry,
- wish to efficiently forecast noise and air pollutants using one tool,
- are employed in the following fields of application: EIA, approval procedures, immission control, air pollution prevention,
- are engaged with environmental simulations in research and teaching.
Vibrations, structural mechanics and acoustics – this is the Wölfel world. Here we are experts, this world is our home. More than 90 employees daily do their best for complete satisfaction of our customers. For more than four decades we support our customers with engineering services and products for the analysis, prognosis and solution of tasks in the fields of vibrations and noise.

Are vibrations really everywhere? Yes! That’s why we need a wide variety of solutions!

Whether it is engineering services, products or software – there is a specific Wölfel solution to every vibration or noise problem, for example

- simulation-based seismic design of plants and power stations
- measurement of acoustic emissions of wind turbines
- universal measuring systems for sound and vibrations
- expert reports on noise immission control and air pollution forecasts
- dynamic occupant simulations for the automotive and aviation industry
- and many other industry-specific Wölfel solutions ...

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